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ECOCYCLE

newsletter on
life-cycle tools,
management and
product policy.

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THE WAY THAT SOCIETY
PRODUCES AND CONSUMES IS
UNDERGOING A REFORMATION.
The object is to produce goods and

editor's column

services that maximize environ-
mental performance as well as
economic efficiency. Driving this
change are:

- the recognition that improved environmental performance and economic efficiency are compatible;
- a growing sense of urgency about the need for more sustainable production and consumption practices;
- a realization that preventing pollution is the best way to reach environmental policy objectives;
- the integration of environmental considerations in all stages of the life cycle of products (raw material acquisition, design and manufacturing, consumption and use, and disposal and recovery);
- marketplace demands for information on the environmental performance of products as well as traditional cost and product quality data; and

- a growing interest in product stewardship and cradle-to-grave management of products and services.

The response has been an explosion of tools and techniques to improve the environmental and economic efficiency of products and services. Environmental management systems, design for environment tools, life-cycle management techniques, closed loop industrial processes, environmental technologies, and product stewardship programmes are all being adopted and implemented by industry and governments.

In this issue of *Ecocycle* you will read about activities in this reformation. There are examples involving government, industry, the academic community, environmental groups and standards organizations. The encouraging sign is the many cases in which these diverse groups are working cooperatively toward improving the environmental performance of products.

We hope you find this *Ecocycle* issue stimulating and informative. If you have any comments, suggestions, or article ideas, please contact Kevin Brady, Environmental Protection Service, Environment Canada, Place Vincent Massey, Ottawa, Ontario K1A 0H3. ●

WHILE THE CONCEPT IS ELEGANT, ACTUALLY DOING A LIFE-CYCLE ASSESSMENT STUDY IS NOT SO STRAIGHTFORWARD. Getting data, scoping the study and assessing impacts is a long, complex task. So is deciding what to do with the results and figuring out what it "really" means.

Here comes streamlined LCA. The idea is to take LCA beyond

the hands of specialists to a broader group that can apply it more directly, make practical decisions and undertake environmental improvements — faster, easier, and

streamlining LCA

cheaper. The challenge is to do it without sacrificing either the

continued on page 4

CARS AND TRUCKS ARE THE MOST HIGHLY RECYCLED DURABLE GOODS in the United States, ahead of aluminum cans, paper or glass. Every year, 94% of all vehicles in the U.S., approximately 10 million, are returned for recycling. Now, looking for ways to improve recycling and to increase the proportion of recycled material, the Vehicle Recycling Partnership (VRP)

Ford's Automobile Polymer Science Department and chairman of the VRP. "It's been a tremendous positive response from the designers and other people who are involved with manufacturing".

The VRP's Vehicle Recycling Development Center (VRDC) in Michigan has a first-year operating budget of a million dollars, and expects to gain another \$500,000

by auctioning parts from dismantled vehicles. Researchers will work with the American

Recyclers Association (ARA) and other research scientists and engineers focusing on the 25% of automobile content not yet being recycled, including fluids, plastics, glass, rubber, adhesives, fabric and paint. Three million tons of this "auto shredder residue" or "fluff" is land-filled annually, contributing about 2% of all municipal solid waste.

The Big Three American automobile makers, Chrysler Corp., Ford Motor Co. and General

Motors Corp., formed the VRP in 1991 to jointly research and develop recycling, reuse and disposal of vehicles and automotive components. The VRP is part of the United States Council for Automotive Research (USCAR), which promotes pre-competitive cooperative research and development programmes.

The fastest growing automotive material, plastics, is getting special attention. The challenge comes from the many different types of plastics and bonding methods that make sorting difficult. The three auto makers have already agreed to put standard codes on parts over 100 grams to help dismantlers sort them.

The American Plastic Council (APC) is also collaborating to recover and recycle automotive plastics more easily and economically, and the VRP has signed a research agreement with the Institute for Scrap Recycling Industries (ISRI) to identify reuse opportunities and to develop recycling technology. ●

vehicle recycling partners

is set to dismantle about 500 vehicles a year in a new 63 000-square-foot research center in Michigan.

The VRP not only is looking at disassembly, but is also looking upstream and asking suppliers to develop plans to use recycled materials in new parts, and engineers are now considering recyclability in future designs.

"Educating engineers is a very important part of the recycling center", says Sandy Labana, manager of

publisher's message

Ecocycle is published bi-annually by Environment Canada and delivered free of charge to national and international industry, government and non-government organizations and individuals interested in developments on life-cycle management tools and product policy.

Please forward questions or comments to:

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Ottawa, Ontario, Canada K1A 0H3.

Phone: 1-819-997-3060

Fax: 1-819-953-6881

Email: kbrady@synapse.net

Ecocycle is also available on the Internet at:

www.doe.ca/ecocycle

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new nordic guidelines

THE NORDIC COUNCIL OF MINISTERS HAS RECENTLY PUBLISHED the 225-page *Nordic Guidelines on Life-Cycle Assessment*. A result of the Nordic Project on Life-Cycle Assessment (LCA), it gives industry and other LCA practitioners a code of practice and guidelines for LCAs.

The guide discusses goal definition and scoping, inventory analysis, classification and characterization, normalization and valuation methods, reporting and communication, and other issues. ●

A QUEBEC PLASTICS FIRM IS LIKELY TO SAVE ABOUT A QUARTER OF A MILLION DOLLARS OVER the next decade, using a pilot environmental profiling technique developed by The National Packaging Task Force of the Canadian Council of Ministers of the Environment.

The Task Force developed guidelines on profiling to help companies rate their own environmental performances. A guidebook, *Environmental Profiles: Guidelines to Help Industry Meet the Goals of the National Packaging Protocol*, leads small and medium-sized businesses through a step-by-step analysis of the environmental performance

Examples of Reduction Measure Savings

Input/ Output	Reduction Measure	Capital Costs	Projected Savings	Payback Period
Ink	modify tanks	\$1200	\$1680/yr	9 months
Ink	employ volume meter	\$1200	\$8400/yr	7 weeks
Ink	interchangeable ink tanks	\$14000	\$8400/yr	20 months
Oil	tank below machine	\$2400	\$1500/yr	19 months
Oil	plug leaks	\$8000	\$1500/yr	64 months

Five plastic products offered the greatest potential. Four were injection-moulded: a 175-g yogurt container, a 2-lb. margarine container and its lid, and an industrial container. The fifth was a soup bowl made by compressing melanine powder.

the 175-g yogurt container, a joint project with Hydro-Québec to recover heat from the cooling water system, and testing a new type of ink fountain to minimize ink losses.

Potential reduction measures were analyzed by calculating the capital costs and savings and by assessing investment payback periods of less than two years. The table above shows examples of the costs and savings of six reduction measures.

Overall, reduction measures had an initial cost of \$75 000: \$15 000 for the case study and \$60 000 for the measures themselves. Anticipated yearly savings are \$32 000, or an investment return of 2.3 years and a projected ten-year saving of about a quarter-million dollars. ●

saving money with environmental profiles

of their packaging system to find improvements.

The main steps are Profile Initiation, System Inventory, Reduction Measure Identification and Implementation.

To test the guidelines' user-friendliness, Environment Canada did a case study with GenPak Canada in Cookshire, Québec. A subsidiary of the Hamelin Group, GenPak manufactures plastic packaging products primarily for the food and dairy markets.

Following the guide, GenPak took about four months to develop its environmental profile.

GenPak's activities for each of the steps follow:

STEP 1 - Initiating the Profile

GenPak formed a team of two junior engineers, the plant superintendent and the production, maintenance and quality control managers. The team identified its objectives as reduced inputs, and reducing or reusing non-product outputs.

STEP 2 - System Inventory

GenPak based measurements on one complete production run. For the yogurt containers, for example, it was 111,000 units. Data collected during actual production ensured accurate measurements, and further data were obtained through theoretical estimates or from previous studies. The data and the flow diagram were used to complete an inputs/outputs worksheet.

STEPS 3 & 4 - Identifying and Implementing Reduction Measures

Using the guide's worksheets, the team identified possible reduction measures for each input and output, ranking and grouping them into short-, medium- and long-term categories, emphasizing short-term reduction measures, input and output losses and the capital costs required to implement these measures.

Several short-term measures were implemented without further analysis. These included reusing corrugated boxes, changing the resin for

LCA on the Net

If you are interested in finding LCA information electronically, try surfing to this WWW site:

<http://www.ecf.toronto.edu/~young>

You'll find the LCA home page of Steven Young, University of Toronto. The site lists LCA related projects, contacts and publications, and offers options to connect with other WWW sites.

(See also the WWW site address listed in the article "Environmentally Design and Manufacturing Research".) ●

Streamlining LCA

continued from page 1

technique's comprehensive nature or its accuracy and credibility.

Both the Society for Environmental Toxicology and Chemistry (SETAC) and the U.S. Environmental Protection Agency (EPA) have LCA streamlining projects.

SETAC

Since 1990, SETAC, a multidisciplinary professional society, has led LCA developments, further defining and documenting the methodology through organized groups and symposia. Currently, six Work Groups coordinated by the SETAC LCA Advisory Group are considering different facets of LCA. The Streamlining Work Group has met several times in 1994-95 and undertaken a survey of methods and practices aimed at producing a how-to "framework" document for streamlining LCA.

EPA

As part of a comprehensive research programme the U.S. EPA's National Risk Management Research Laboratory hosted a meeting in Cincinnati, Ohio, on June 12 & 13, 1995, on streamlining LCA. Organized by the Research Triangle Institute's Center for Environmental Analysis, the conference allowed practitioners and researchers to present the most up-to-date information on streamlined approaches.

The general emphasis was on the high value of LCA as a tool, where it is being used within organizations for product and process improvement or as part of their strategic decision-making process.

Several participants had useful suggestions for abridging LCA. Roy F. Weston Inc. illustrated how to integrate life-cycle considerations with economic and technical criteria in a "design for environment"

BEFORE GRANTING ITS ENVIRONMENTAL CHOICE[™] ECOLOGO[™] to a product or service, Environment Canada uses life-cycle review to evaluate the environmental impacts of the product or service.

EcoLogo



Areas researched include environmental, health and safety issues, resource and energy consumption, market data on the product and industry sector, and socio-economic data. The programme examines available research and life-cycle assessments, but does not typically carry out primary research.

One exception was recent new guidelines on sanitary paper products such as toilet tissue and paper

towels that attempted to base criteria on actual industry performance. The programme gathered current data from Canadian pulp and paper manufacturers on energy consumption, water effluent, solid waste generation, air emissions, and material consumption. The last category includes industrial scrap and both post-consumer and pre-consumer recycled materials.

The programme used results to choose five parameters to develop a scoring system based on load-points. It allows flexibility, but ensures that only the top 10-25% of industry will be eligible for EcoLogo product certification. A similar load-point system will be used to revise the fine paper guidelines in coming months. For more information, please call Lynne Patenaude at 1-613-247-1900. ●

matrix. AT&T uses "abridged LCA" to score product and process alternatives across five life-cycle stages and five environmental issues. Battelle Laboratories has developed an LCA "pollution prevention factors" methodology for a lithographic printing case study. The Scientific Consulting Group and the American Institute of Architects use a modified LCA framework employing qualitative information and expert judgement to assess architectural materials and building design.

It was observed that the sophistication of LCA can vary and that all LCAs are really "streamlined" in one way or another. Some LCAs are "more complete" in data and inventory categories, life-cycle stages considered, and the thoroughness of the impact assessment. Other LCA methods are less complete in their consideration of the above. Research Triangle Institute

provided a list of streamlining techniques based on interviews with LCA practitioners:

1. omitting one or more stages in the life cycle
2. focusing on only a specific set of environmental issues
3. limiting analysis to a shortened list of inventory categories
4. omitting impact assessment
5. using qualitative information
6. using surrogate data from previous studies
7. applying threshold levels to stop analysis at specific points.

Many meeting participants said that a study that does not cover all life-cycle stages from "earth to earth," should not be called a life-cycle study. Although it may use LCA methods, it is perhaps better called an "eco-profile" or a "process inventory".

by Steven B. Young
University of Toronto

THE FOREST SERVICE OF NATURAL RESOURCES CANADA, ENVIRONMENT CANADA AND THE CANADIAN STANDARDS ASSOCIATION (CSA), in cooperation with the Canadian Pulp and Paper Association (CPPA), have initiated a project to develop a voluntary guidance publication to improve the environmental performance of pulp and paper production.

The aim of the project is to develop a guidance document for mill managers that will assist them in making internal improvements in areas such as pollution prevention and resource conservation.

A CSA Technical Committee comprising industry, government, NGO and academic representatives

is currently evaluating the Phase One report. The Committee will be converting the report into a practical guidance document for mill managers in the coming months.

the project team evaluated 37 potential impact stressors (metrics). It then used a rigorous six-step process to classify known potential impact stressors such as sulphur oxide

assessing pulp and paper impacts

Phase One has applied basic principles of life-cycle impact assessment — classification, characterization, evaluation — to identify key environmental metrics (indicators) associated with the production phase of the pulp and paper life cycle.

Considering current environmental regulatory, public and market issues and trends in the industry,

compounds first into broad categories such as air emissions and then into sub-categories such as acid rain. Primary, secondary, tertiary and quaternary impact chains were identified for each stressor, then potential metrics associated with the stressor were classified and evaluated for the guidance document.

For more information contact Kevin Brady at 1-819-953-1112.

news on Green Design

GREEN DESIGN, a new quarterly newsletter published by the non-profit Sustainable Development Association, links the ideas and issues of sustainable development and product design. Each issue explores new products, materials, processes and companies. The entire green design process, including LCA, is covered, as are manufacturing process issues, packaging and Internet activities related to environmentally responsible design.

Subscriptions are \$20/yr. For a sample issue please send \$5 to cover P&H to:

Sustainable Development Association

4560 Mariette

Montréal, Québec H4B 2G2

Tel: 1-(514) 482-5033

Fax: 1-(514) 482-6823

Email: sda@grndsn.login.qc.ca

THE INTERNATIONAL INSTITUTE FOR INDUSTRIAL ENVIRONMENTAL ECONOMICS (IIIEE) at Lund University, Sweden, is welcoming qualified applicants with economics, engineering, law, or environmental studies degrees to apply for its second Masters programme, set to begin in August, 1996.

environmental studies in Sweden

The deadline for applications to the programme, which integrates both engineering and economic concepts and practices, is November 15, 1995.

The IIIEE, founded by the Swedish Parliament in 1994, emphasizes preventive environmental strategies to reduce emissions in business and industry.

IIIEE faculty say environmental concern is not a threat or cost for industry, but an opportunity. Research topics include environmental management standards, green product design, crafting legislation and policy to close material loops and prevent waste and pollution, extended producer responsibility, and the internalization of external environmental costs.



To that end, the Institute works with both industry and government to help improve environmental performance in production and to set policy to promote preventive environmental strategies.

For more information about the IIIEE or its M.Sc. programme, please contact: IIIEE, Box 196, S-221 00 Lund, Sweden, telefax +46-46-222 0210. ●

THE ENVIRONMENTALLY CONSCIOUS DESIGN & MANUFACTURING (ECDM) RESEARCH GROUP AT WINDSOR, established in August 1993, studies concurrent product design and analysis; design for recycling; design for disassembly; and, specifically, development of computer tools for green design, green manufacturing, and product life-cycle assessment.

The group has collaborated with local industry to:

- Develop computer tools for disassembly analysis and life-cycle assessment for use at the Vehicle Recycling Development Center at Highland Park, Michigan.
- Analyze disassembly and recycling operations for two local pallet recyclers.
- Analyze operations and assess material reclamation value for the Laidlaw disassembly facility at Hamilton.

The group maintains an Internet mailing list, a World Wide Web (WWW) site, and an information base of publications related to ECDM. Currently, the mailing list has about 320 participants, most in the U.S. and Europe. Addresses are:

Mailing List:

E-mail: listserv@uwindsor.ca with "sub ECDM first-name last name"

WWW:

URL: http://ie.uwindsor.ca/ecdm_lab.html

For more information, please contact: University of Windsor, Windsor, Ontario N9B 3P4. Tel: 1-(519) 253-4232, ext. 2607.

Email: wang5@ie.uwindsor.ca

environmental design & manufacturing research

By Michael Wang
Department of Industrial Manufacturing & Engineering
University of Windsor

A NEW BOOK ON THE INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO) 14000 Series of environmental management standards is slated for October release.

The guide previews ISO 14000 for companies that want to know what ISO is and how it will affect them. In addition to tracing the history and development of the standards, it describes each standard in the series, including the environmental management systems, environmental auditing, environmental

understanding ISO 14000

labelling, environmental performance evaluation, and life-cycle assessment.

The guide also includes international and domestic implications of ISO 14000, the likely registration process and guidance in implementing the standard.

To order: in the United States, call 1-800-634-3966, ext. 1824 or fax 1-800-926-9495; outside the U.S., call Tawana Kilpatrick at 1-(708) 789-2110 or fax 1-(708) 789-6933. ●

SINCE 1992, GRADUATE ENGINEERING STUDENTS AT MONTREAL'S CONCORDIA UNIVERSITY have been using Environmental Life-Cycle Assessment (ELCA) to make housekeeping improvements, recycling strategies, reformulations for input products and data collection programmes for local companies. They've profiled 41 companies so far.

The profiles have been mainly qualitative, but have shown general waste releases and their possible contributions to global environmental issues. Most companies recognized the value and benefits of

the ELCA, but felt the process was complex.

Students learn ELCA principles and practices by analyzing case studies, examining database frameworks, and applying impact methodologies. Company environmental profiles form the students' major projects.

After contacting a local manufacturing or service company, students familiarize themselves with the industry's environmental and technological issues. They compare a company to the industry as a whole to increase their under-

standing of generic production issues related to a product, then use

Concordia grads conduct profiles

ELCA tools to develop input-output profiles of a plant, setting boundaries at the company fence.

By Bernice Goldsmith, Social Aspects
of Engineering, Concordia University

MORE THAN 150 PARTICIPANTS AGREED THAT INTEREST IN life-cycle management and pressure on manufacturers to accept life-cycle responsibility is growing, at an Environmental Life Cycle Management workshop in Ottawa April 27.

life-cycle workshop report

Representatives from government, industry, environmental and educational fields felt that life-cycle assessment and related tools are becoming better recognized as a systematic approach to environmentally sound planning, design and production.

Discussions focused on key life-cycle management drivers such as consumer demand, economic efficiency, and international

competitiveness and trade. The workshop also explored the benefits to industry of implementing pollution prevention throughout product life-cycles. These include reputation, reduced liability, lower costs, larger market share, competitive advantage and improved environmental performance.

Topics included life-cycle concepts, tools, and applications. In addition to the Environmental Choice Program, presenta-

tions focused on product-oriented environmental policy, trade and competitiveness implications, environmental profiles, life-cycle inventory databases and models, and ways of applying the life-cycle approach to the auto, pulp and paper, energy, and steel industries.

For copies of the workshop report and presentations please contact: The Hazardous Waste Branch, Environment Canada, Ottawa ON K1A 0H3. Tel: 1-(819) 997-3060; fax: 1-(819) 953-6881. ●

Second SETAC World Congress in Vancouver

Held November 5-9, 1995, this meeting offers a session on LCA and related programmes. The session will include overview papers, new developments and approaches, case studies, and regulatory implications of LCA. A short course on LCA is also offered which focuses on impact assessment needs and life-cycle inventory guidelines together with hands-on demonstrations to determine the strengths and limitations of LCA. For registration information, contact SETAC Office, 1010 North 12th Avenue, Pensacola, FL 32501-3370.

THE ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT'S (OECD) POLLUTION PREVENTION AND CONTROL GROUP (PPCG) is working on reducing the overall pollution burden of OECD countries.

PPCG policy favours the adoption and distribution of environmentally sound technologies, products and consumption models.

Work areas include: Energy, Climate Change, Environmentally Sustainable Transport, Cleaner Technologies, Sustainable Product Policies and Life Cycle Manage-

ment (LCM), and Waste Minimization.

For sustainable product policy and LCM, the PPCG programme focuses on awareness of analytical developments in life-cycle assessment and other decision support tools; examining developments in product policies and identifying similarities among policy tools, opportunities, limitations and strategies for life-cycle management; and developing guidelines for government procurement.

The OECD Secretariat is working on related projects: 1) a mono-

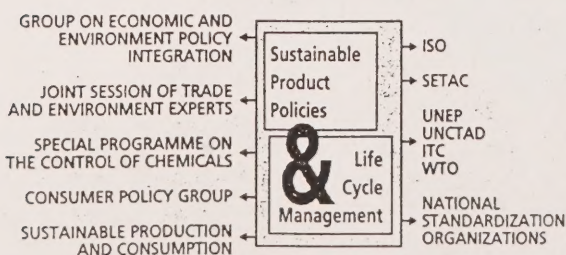
graph entitled *The life-cycle approach: an overview of product/process analysis*; 2) a survey of member

countries to address expectations and concerns of government, producers, consumers and others regarding life-cycle approaches in product policies; 3) a study of

international view

"extended producer responsibility" programmes; 4) a paper on government purchasing of environmentally preferable products for a PPCG policy workshop; 5) case studies to examine concerns arising from the adoption of life-cycle approaches in product policies; and 6) input for policy conferences in Norway in 1996 and in Switzerland in 1997.

The accompanying diagram shows the network the PPCG has developed with other organizations and other parts of OECD. ●



"ENVIRONMENTAL ECONOMICS" IS A PACKAGE OF TOOLS AND CONCEPTS TO AID DECISIONS about the environment and the economy. It recognizes that the environment contributes three

total needs of present and future generations. This scarcity and the need to minimize opportunity costs makes identifying the full cost of any product, including all environmental costs, a priority.

tion to overall environmental scarcity; second, data to compare consistently one product with another. Different products can satisfy needs at different environment costs.

Once the full cost of a set of products is identified, environmental economists can design a set of economic instruments to internalize previously unrecognized environmental costs. These instruments will change the incentives to producers and consumers in a way that minimizes opportunity cost.

By Robert Fenton
Department of Economics
University of Winnipeg

environmental economics

categories of economic value: raw material and energy to support consumption and production processes (including life-support systems); amenities that increase quality of life; and waste absorption capability to assimilate and degrade some waste material generated by economic activity.

These categories of value are interrelated in the sense that increasing exploitation of one often can be accomplished only at the cost of a decrease in another. An optimal mix of environmental services will maximize net satisfaction by minimizing the opportunity cost of any programme of activities.

Environmental economics also compares the overall scarcity of environmental resources against the

Product life-cycle inventories and analyses of impacts help us assess the full cost of products. To do so, we need two kinds of information: first, data on a product's contribu-

LCA for small enterprise

LIFE-CYCLE REVIEW (LCR) – Z760.1 gives small and medium enterprises an economical yet complete way to conduct a life-cycle assessment (LCA), called a life-cycle review (LCR). LCR is less detailed and more qualitative than LCA techniques outlined in CSA Guideline Z760. Expected availability in September.

For more information contact
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Canadian Standards Association
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Fax: 1-(416) 747-2473.

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